The Influence of Genetic, Environmental and Racial Defendant Characteristics on Criminal Trial Outcomes

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Statement of Sources

I declare that this report is my own original work and that contributions of others have been duly acknowledged.

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Abstract

There is emerging evidence that aggression and antisocial behaviour may be influenced by the interplay between the low activity Monoamine Oxidase A (MAOA) genotype and history of childhood maltreatment exposure. Establishment of the genetic and environmental determinants of aggressive, antisocial behaviour has resulted in the court application of behavioural genetics evidence to achieve exculpation or leniency in the defendant's criminal sentence. However, this is yet to be explored in the context of racial differences. The present research aimed to build upon existing literature concerning the efficacy of the application of behavioural genetics evidence in court, by examining the cumulative influence of a defendant's genetics, environmental trauma and race on judiciary sentencing decisions. A total of 145 participants (118 female, 27 male), with ages ranging from 19-67 years, were randomly allocated to one of eight vignettes, where in which explanations concerning the defendant's genetics, childhood maltreatment and race were manipulated. Participants completed questions relating to their perceptions of defendant criminal culpability and appropriate sentence severity, and a self-report questionnaire to assess their attitudes towards modern genomics (PUGGS; Carver et al., 2017). Findings demonstrated no interaction between MAOA genetic, environmental trauma and Indigeneity status defendant characteristics on judicial culpability and sentence severity determinations. However, there was a modest effect on MAOA genetic evidence on judicial prison length decisions. This research is the first of its kind in an Australian population and contributes meaningful results to a growing field.

Over recent decades, advances in behavioural genetics research have established evidence of genetic and environmental determinants of aggressive and antisocial behaviour (Baum, 2011). Research exploring the heritability of impulsive aggression and antisocial behaviour has implicated the Monoamine Oxidase A (MAOA) gene, which produces an enzyme implicated in the degradation of monoamine neurotransmitters (Appelbaum, Scurich & Raad, 2015). Possession of the MAOA gene and a history of childhood maltreatment has been associated with the dysregulation of behavioural impulses, and a strong susceptibility to aggressive, hostile behaviour (Kim, Boytos, Seong & Park, 2015). Empirical evidence identifying the genetic and environmental foundations of aggressive, antisocial behaviour have stimulated the application of behavioural genetics evidence in criminal court proceedings (Krauss & Sales, 2001). Defence attornies utilisation of behavioural genetics evidence is intended to depict the defendant as having diminished capacity over their heightened vulnerability to impulsive violence, and to warrant a diminution to their criminal sentence (McSwiggan, Elger & Appelbaum, 2017). However empirical examinations concerning the efficacy of the utilisation of behavioural genetics evidence in court has produced conflicting results (Kim et al., 2015; Appelbaum et al., 2015; Costa, Pate & Gibson, 2017).

In addition to genetic and environmental trauma defendant characteristics, the racial background of a defendant has been found to influence judicial sentencing decisions (Pettit & Western, 2004). Research has established that minority defendants are subjects of disparate treatment, and are often vulnerable to punitive sentencing outcomes (Kleck, 1981). Due to Australia's multicultural population, which consists of numerous minority groups and a dominant Caucasian class, it is feasible to propose that the Indigenous Australian status of the defendant may influence judicial sentencing decisions (Bottoms, Davis & Epstein, 2004). However, Australian sentencing research exploring the influence of defendant's Indigenous

status on sentencing outcomes has produced mixed findings (Jeffries & Bond, 2009; Snowball & Weatherburn, 2006; Bond & Jeffries, 2011**).** Therefore, this thesis aims to further examine the influence of behavioural genetics evidence on judiciary sentencing decisions in the context of racial differences.

Monoamine Oxidase A Gene

The MAOA gene is located on the X chromosome, and is a key enzyme in the catabolism of certain neurotransmitters (i.e. serotonin, dopamine, norepinephrine) (McSwiggan, Elger & Appelbaum, 2017). The MAOA gene contains specific alleles that are classified into two categories: a high activity MAOA gene variant, and a low activity MAOA gene variant (MAOA-L) (Beaver, et al., 2013). MAOA-L gene variants demonstrate a reduced efficiency in catabolising neurotransmitters and therefore produce higher than normal levels of serotonin in the brain (Buckholtz & Meyer-Lindenberg, 2008). Consequently, MAOA-L gene possession has been associated with hyperresponsive amygdala activation during emotional arousal and reduced activity of the brain's regulatory prefrontal regions (Meyer-Lindenberg et al., 2006). Therefore, inheritance of the MAOA-L gene variant is associated with the inability to sufficiently regulate and control reactive emotions and is considered as a risk allele for developing psychopathologies and impulsive aggressive, antisocial behaviour (Gordon, 2016).

The work by Cases and Colleagues (1995) first demonstrated the presence of several behavioural abnormalities in MAOA knockout mice. The deletion of the MAOA gene in the mice caused a dramatic elevation of serotonin, dopamine and norepinephrine levels (Raine, 2008). Such circulation of abnormally high levels of neurotransmitters in the MAOA-deficient mice revealed heightened amygdala-dependent emotional learning and increased aggression (Myer-Lindenberg et al., 2006) and was associated with various aggressive behaviours and included: territoriality, dominance, defensive aggression, and predatory

violence (Raine, 2008). Furthermore, in young MAOA knockout mice, heightened levels of serotonin during infancy was suggestive of being a risk factor for future impulsive aggression (Beaver et al., 2013). Cases and colleagues (1995) findings identifying the association between MAOA gene deficiency and aggression in animal models has provoked the examination of whether such a vulnerability is present in human clinical samples.

Evidence of a possible human homologue of the MAOA gene knockout mice was discovered by Brunner and colleagues (1993), when researching the pattern of familial violence in a Dutch kindred. Inspection of the fourteen males within this family lineage, evidenced for an unidentified disorder that was characterised by impulsive aggression, borderline mental retardation and hypersexual behaviour (Brunner et al., 1993). Their susceptibility to violent, impulsive behaviour provoked a range of criminal offenses including rape, murder, aggravated assaults and arson (Brunner at al., 1993). Examination of potential explanatory genetic determinants of this disorder found that all males demonstrated a complete deficiency of MAOA gene activity (Denno, 2011). As a result, the innovative research by Brunner and colleagues (1993) established that isolated MAOA gene deficiency in the kindred operated to predispose affected males to abnormal, impulsive aggressive behaviour.

Most research concerning the functional role of the MAOA-L gene variant in aggressive behaviour has demonstrated that increased impulsivity only occurs when the individual has been exposed to detrimental early-life mistreatment (Byrd & Manuck, 2014). Therefore, this highlights the importance of the assessment of the significant interplay between genetics and environmental trauma, when determining the origin of antisocial, criminal behaviour.

MAOA Gene x Environmental Interaction

Maltreatment can occur in numerous forms, ranging from physical, emotional and sexual abuse, to negligence and abandonment (Huizinga et al., 2006). Children who are exposed to familial trauma, for example physical abuse, inter-parental aggressive violence or maternal rejection, demonstrate large irregularities in their mental health outcomes (Kim-Cohen et al., 2006). Childhood maltreatment has been associated with emotional dysregulation and heightened arousal to stress and conflict (Byrd & Manuck, 2014). Consequently, it is argued that the possession of the MAOA-L genotype can moderate the influence of childhood maltreatment on the neural systems that are commonly involved in aggressive, antisocial behaviour (Caspi et al., 2002).

Caspi et al. (2002) explored the genetic and environmental association of aggressive violence by investigating a cohort of males who had been exposed to repetitive childhood abuse and were in possession of the MAOA-L gene. Results indicated that male carriers of the MAOA-L gene, who had suffered a history of childhood maltreatment, demonstrated a proclivity towards committing violent criminal offenses in adulthood (Caspi et al., 2002). Various studies have further supported Caspi et al.'s (2002) research findings concerning the association between the MAOA-L genetic and environmental determinants of impulsive aggression (Kim-Cohen et al., 2006; Huang et al. 2004; Foley et al. 2004). However, the work by Huizinga et al. (2006) failed to support the hypothesis of a moderating influence of the MAOA-L gene on the relationship between childhood maltreatment and future impulsive aggression. Absence of an effect may be attributed to Huizinga et al.'s (2006) incorporation of only a single component of physical abuse (violent victimisation) to assess maltreatment. Furthermore, Huizinga et al.'s (2006) non-significant MAOA-maltreatment interaction may be ascribed to the age in which childhood maltreatment was assessed, as Caspi et al.'s (2002) research assessed maltreated children from birth- adulthood, whilst Huizinga et al. (2006) measured maltreated children between the ages of 11-17. Taken together, the available

evidence demonstrates that the interaction between childhood maltreatment exposure and possession of the MAOA-L gene variant is a robust predictor of future impulsive aggression (Huizinga et al., 2006).

Court Application of Behavioural Genetics Evidence

Advancements in understanding the genetic and environmental determinants of aggressive, antisocial behaviour have motivated legal professionals to utilise genetic evidence in court to achieve exculpation or leniency of the defendant's sentence (Bernet, Vnencak-Jones, Farahany & Montgomery, 2007). Despite the current advancements in behavioural genetics research, there is only a scant body of research that has examined its utilisation in criminal trials (Scurich & Appelbaum, 2017).

Of the few studies that have focused inquiry on the influence of the MAOA genotype on juror's sentencing decisions, findings have often been mixed. For example, Aspinwall, Brown and Tabery's (2012) research examined the influence of a defendant's psychopathy diagnosis presented with either a presence of absence of MAOA-L genetic evidence on judicial sentencing judgments. Findings demonstrated that the MAOA-L genetic explanation of the defendant's psychopathy increased judge's ratings of the defendant's mental disorder as mitigating, and imposed shorter sentence outcomes. Contrasting to Aspinwall et al.'s (2012) findings of a mitigating influence of the MAOA-L gene, Appelbaum, Scurich and Raad's (2015) research demonstrated that the MAOA-L genetic explanation of the defendant's heightened vulnerability to violence had no significant impact on juror's sentence decisions. Appelbaum et al.'s (2015) research implemented three hypothetical criminal trial scenarios, and randomly assigned participants to different experimental conditions, where in which evidence type, criminal history and crime type were systematically varied. Across all three cases, the genetic explanation of the defendant's criminal behaviour had no influence

on juror's length of sentence decisions.

Moreover when assessing the interactive influence of the MAOA-L gene and childhood maltreatment evidence on juror's decision-making, Kim, Boytos, Seong, and Park (2015) demonstrated how the admittance of MAOA-L gene evidence to the trial of an abused defendant operated to reduce the defendant's culpability and sentence length outcomes. Kim et al.'s (2015) study provided mock jurors with a non-capital murder trial summary, where in which the presence of MAOA-L and childhood maltreatment information was varied. Although Kim et al.'s (2015) research incorporated various manipulation conditions to determine causality, their reliance on undergraduate students limits the external validity of their research, as student's sentencing decisions will contrast to those of members from the general population. Moreover, Kim et al.'s (2015) failure to implement stimulus sampling restricts their findings to only a single instance. Consequently, Kim et al.'s (2015) omission of multiple murder trials reduces both the cross-stimulus generalisation and construct validity of their research.

Contrasting to Kim et al.'s (2015) previous findings of a mitigating effect of behavioural genetics evidence, Appelbaum and Scurich's (2014) research demonstrated that jurors who were presented with both the genetic and abuse explanations of the defendant's crime imposed longer prison sentences. Appelbaum and Scurich's (2014) research presented mock jurors with a case summary concerning an impulsive homicide, and randomly assigned participants to different experimental conditions, where in which explanations of the defendant's behaviour were systematically varied (i.e. child abuse; genetic predisposition; child abuse and genetic predisposition; or simple impulsive behaviour). Although Appelbaum and Scurich's (2014) research provides evidence to suggest that the impact of genetic and trauma evidence in trialling processes may provoke aggravating reactions in jurors, their research exhibits poor ecological validity, as hypothetical case vignettes do not directly

correspond to realistic court trial testimonies. Consequently, Appelbaum and Scurich's (2014) research cannot provide thorough insight into how participants would respond in realistic trial settings, or to vignettes containing different information (i.e. specific details of the victims or perpetrator).

The work by Costa, Pate and Gibson (2017) further explored the interactive effects of both genomic and childhood maltreatment evidence on jurors sentencing decisions. Findings demonstrated that the duration of the defendant's criminal sentence was not mitigated when genetic and environmental trauma related evidence was applied (Costa et al., 2017). Although further determining how explanations of a genetic predisposition to impulsive violence led jurors to be more fearful of the defendant, Costa et al.'s (2017) research demonstrates limitations in their mock jurors instructions. Although intended to establish a thorough understanding of juror's perceptions of the seriousness of the defendant's crime and their culpability, instructing jurors to select the crime in which they believe the defendant should be charged with is not an accurate representation of the actual role of a juror. Jurors are responsible for determining whether they find the defendant guilty or not guilty, not for determining the defendant's criminal charge. Therefore, incorporating the defendant's charge as an outcome measure limits the design accuracy of this study, as it is not representative of real-world courtroom practices (Costa et al., 2017).

Consequently, the presentation of behavioural genetics evidence in criminal trial proceedings can operate to mitigate or aggravate the defendant's criminal responsibility and sentencing outcomes (Appelbaum & Scurich, 2014).

Attributions of Criminal Responsibility

Stevenson, Bottoms and Diamond's (2010) theory of attribution contends that the varying types of ascriptions adjudicators make regarding the cause of a defendant's crime influence their criminal culpability judgements (Stevenson et al., 2010). When examining the

underlying causality of a defendant's criminal behaviour, jurors make attributions concerning whether their behaviour was manageable and stable, in contrast to being irrepressible and unpredictable (Sandys, Pruss & Walsh, 2009). Following this perspective, juror judgements will be more punitive when the cause of the defendant's criminal behaviour is perceived as being both controllable and stable. In contrast, to function as a mitigating factor, evidence must reposition the causality of the defendant's crime from their own free will and instead towards other causal factors that the actor cannot control. Therefore, the lower the perceived stability and intentionality of the cause of the defendant's crime, the less punitive sentencing judgements jurors inflict on the defendant (Stevenson et al., 2010). This can also be considered in relation to genetic defences used in court. For example, Aspinwall et al. (2012) established that the presentation of the MAOA genetic explanation of the defendant's psychopathy elicited more uncontrollable attributions, and thus operated to mitigate the defendants prison sentence.

Juror's perceptions of the defendant's criminal liability may also be influenced by whether they have internalised the free will or genetic determinism theoretical foundations of the causality of human behaviour. The free will approach contends that humans are autonomous actors who possess the ability to freely choose how they interact and behave (Jones, 2003). Following this idea, the individual is therefore solely responsible for their actions and must face the repercussions of their voluntary behaviour. Conversely, genetic determinists perceive human behaviour as largely influenced by biopsychosocial factors (Jones, 2003).

Concordant with the genetic determinism approach, when a defence attorney presents a defendant as pertaining an irrepressible, genetic and environmentally predetermined predilection to engage in impulsive violence, this should operate to elicit a sympathetic reaction in the jury (Gordon & Greene, 2018). As a result, it is expected that juror's will

interpret the defendant as being less criminally liable, and will warrant for a mitigation of the defendant's sentence (Barnett, Brodsky & Davis, 2004). This is further supported by the aforementioned empirical findings by Kim et al. (2015), who demonstrated how the presentation of the defendant as being in possession of the MAOA-L gene and a victim of childhood maltreatment provoked shorter sentencing outcomes.

The absence of an impact of behavioural genetics evidence on jurors sentencing decisions may be attributed to average citizens not accepting or being persuaded by the genetic determinism argument (Scurich & Appelbaum, 2017). Jurors adopting the free will approach may not view behavioural genetics evidence as the primary determinants of a defendant's behaviour, and therefore fail to acknowledge such evidence when determining criminal responsibility or sentencing outcomes (Kim et al., 2015). This is in alignment with the aforementioned empirical findings by Costa et al. (2017) and Appelbaum et al. (2015), who found no influence of behavioural genetics explanations on judicial sentencing decisions.

Racial Background of the Defendant

Sentencing research involving racial defendants has routinely asserted how minority defendants are subjects of disparate treatment during criminal trial proceedings (Spohn, Gruhl & Welch, 1981). Researchers have attempted to discern whether this continual pattern of racial disparity is due to the criminal justice system being racially discriminatory or whether other defendant factors influence sentencing outcomes (Crow & Johnson, 2008). Findings have been mixed, partly as analyses have failed to control for both legal and extra-legal factors that influence sentencing decisions (i.e. criminal record, heinousness of crime) (Pratt, 1998). Failure to control for the influence of such sentencing factors restricts the ability to assert that the disparities in sentencing outcomes are directly attributable to the race of the defendant (Snowball & Weatherburn, 2007).

International sentencing research has routinely established the racial disparities in sentencing outcomes for defendants of African-American and Latin decent (Pettit & Western, 2004). For example, the work by Vito and Keil (1988) evidenced for the racially differential treatment of minority defendants, demonstrating that black defendants were more likely to receive a death sentence, compared to equally culpable white defendants. The work by Petersilia (1983) supports Vito and Keil's (1988) research, confirming that Latino and black defendants received heavier sentences than their white counterparts, who possessed the same criminal records and who had committed the same criminal offenses. These research findings are indicative of a potential presence of racial discrimination in criminal trialling processes, where in which minority defendants may be subjects of more punitive sentencing outcomes (Spohn et al., 1981).

In an Australian context, it has been asserted that the Indigeneity of a defendant may have a direct influence on judicial sentencing outcomes (Bond & Jeffries, 2011). In 2006, it was found that Indigenous Australians were 13 times more likely to be incarcerated than non-Indigenous Australian defendants (Bond & Jeffries, 2011). Consequently, Indigenous Australian's high incarceration rate has led to their overrepresentation in state correctional facilities, with Indigenous Australians comprising 24% of the total prison population (Snowball & Weatherburn, 2006).

Of the scant sentencing research that has been conducted concerning Indigenous Australian defendant's, results are often contradictory (Bond & Jeffries, 2011). For example, Jeffries and Bond (2009) examined the influence of defendant's Indigeneity status on imprisonment decisions in South Australian Higher Courts. Initial findings demonstrated that Indigeneity operated to mitigate the defendant's sentence severity during the early sentencing stage compared to non-Indigenous defendants who committed the same criminal offence (Jeffries & Bond, 2009). However, when deliberating over sentence length, Indigenous

defendants were sanctioned more punitively than their non-Indigenous counterparts, and received longer prison terms (Jeffries & Bond, 2009). Although demonstrating a rigorous statistical design by including a wide range of defendant factors that influence sentencing decisions (i.e. sex, age, employment status), Jeffries and Bond's (2009) study is limited as it was unable to control for selection bias as the data for the conviction stage was unavailable. As a result, this restricts their inferences to only the population convicted and imprisoned (Jeffries & Bond, 2009).

In contrast, Snowball and Weatherburn's (2006) research established that sentencing terms imposed on both Indigenous and non-Indigenous Australian defendants were equivalent in adult higher and lower courts in New South Wales. Snowball and Weatherburn (2006) demonstrated a methodologically rigorous investigation by controlling for sentencing factors (i.e. criminal history, plea to the offence, and nature of the crime) and the avoidance of cross-contamination of case effects by removing defendant's who were on remand for a separate criminal charge during the trialling stage for the offence of direct interest.

Snowball and Weatherburn's (2006) findings revealed no apparent evidence of racial discrimination in sentencing processes and contend that the higher imprisonment rates of Indigenous Australian defendants are attributed to their lengthier criminal records, higher engagement in violent crimes, and increased rates of reoffending. Snowball and Weatherburn's (2006) research is limited by its exclusion of defendants who had previously been incarcerated, as there is a potential for formerly incarcerated racial defendants to experience disparate treatment. Moreover, Snowball and Weatherburn (2006) only assessed main effects, whereas it is possible that racial biases in sentencing processes may operate through interactions.

In contrast, the research by Bond and Jefferies (2011) demonstrated leniency in Indigenous Australian defendants sentencing outcomes in Western Australian higher courts.

Bond and Jeffries (2011) results found a direct negative effect of Indigeneity on sentencing outcomes, demonstrating shorter imprisonment terms for Indigenous Australia defendants, compared to their non-Indigenous equivalents. Although demonstrating strengths by incorporating measures to assess the influence of the defendant's gender, social and personal histories on length of imprisonment, a qualitative design component would have strengthened this research, to discern adjudicators specific Indigenous sentencing attitudes to fully establish the effect of Indigeneity on sentencing decisions.

The Racial Threat Theoretical Perspective

The racial threat perspective contends that the sanctions enforced by the criminal justice system are designed to control racial and ethnic minority groups that serve as a potential threat to the dominant Anglo-Australian social group (Steen, Engen & Gainey, 2005). Furthermore, it is argued that members of the dominant Anglo-Australian social class typically associate racial minority members with the negative preconceived stereotypes of threat and criminality (Brennan & Spohn, 2009). Consequently, legal practitioners may rely on racial stereotypes such as dangerousness and reoffending, to assist in arriving at rational sentencing decisions for racial defendants (Brennan & Spohn, 2009). From this perspective, as a result of a white ethnocentrism in the Australian community, members will attribute a positive image to non-Indigenous defendants, whilst in contrast, may associate Indigenous Australian defendants with the preconceived negative racial stereotypes of delinquency and dangerousness (Brennan & Spohn, 2009). Thus, by associating Indigenous Australian defendants with minority groups previously connected with dangerousness, high criminal culpability and a reduced likelihood for rehabilitation, these preconceived notions are speculated to generate harsher judicial sentencing outcomes (Turoy‑Smith, Kane & Pedersen, 2013). The empirical findings by Jeffries and Bond (2009) support the notion of the punitive

sentencing practices imposed on minority defendants, by demonstrating longer imprisonment terms imposed on Indigenous Australian defendants, in comparison to their non-Indigenous defendant counterparts.

The research findings demonstrated by Bond and Jeffries (2011) provide supporting evidence to argue that Indigeneity in Australia may not impact judicial decision making in the same prominent way that racial status does in the American criminal justice system. Bond and Jeffries (2011) assert that judges may be aware of the impact of pre-existing racial stereotypes on Indigenous Australians sentencing outcomes, and may not be subconsciously relying on the negative racial threat attributions of blameworthiness and danger. However, perceptions relating to maladjustment, marginalisation and the effect of colonisation operate to influence judicial evaluations of defendant blameworthiness and dangerousness (Bond & Jeffries, 2011). Results demonstrating leniency in sentencing decisions for Indigenous Australian defendants may be suggestive of judicial awareness regarding the underlying social, economical, political and historical disadvantages experienced by Indigenous defendants. Consequently adjudicators thus may be considering the defendant's Indigeneity as a potential mitigating factor (Turoy‐Smith et al., 2013). It is evident from the empirical research and theoretical perspectives concerning racial influences on sentencing decisions that Indigeneity status may produce mixed sentencing outcomes across Australian jurisdictions (Jeffries & Bond, 2009).

The Present Research

Despite current advances in behavioural genetics research establishing the genetic and environmental determinants of aggressive, antisocial behaviour, there is a scarcity of empirical research investigating its apparent influence on judicial sentencing decisions. Attention has primarily focused on the influence of the defendant's genetic background

(MAOA gene) on juror's sentencing determinations. However, as established by Australian sentencing research, the Indigenous status of the defendant is operating to produce conflicting sentencing outcomes (mitigation, aggravation and no effect). Therefore, the broad aim of the present research is to provide an examination of whether or not introducing MAOA genetic evidence into criminal trial proceedings influences juror perceptions of defendant culpability or severity of sentence. Moreover, the present research will further explore how a defendants Indigeneity status, genetics and history of maltreatment, interact to influence juror's culpability and sentencing decisions. Assessing this proposed interaction will not only contribute to the expanding body of research concerning the efficacy of MAOA genetic evidence as a defence strategy, it will also enhance our understanding of how Australian Indigeneity status further influences judicial sentencing decisions.

Therefore, it is hypothesised that the MAOA genetic explanation of the defendant's behaviour will operate to reduce mock juror's perceptions of the defendant's criminal culpability, and will warrant a reduction in sentence length outcomes.

Consistent with the racial threat perspective concerning the sentencing outcomes of minority defendants, it is also hypothesised that an Indigenous Australian defendant's criminal culpability will increase when genetic and environmental trauma evidence is introduced, and will warrant a longer sentence. Conversely, it is hypothesised that a Caucasian defendants criminal culpability and sentence outcome will be mitigated when both genetic and environmental evidence is applied.

Method

Participants

Participants (*N*= 145), with ages ranging from 19-68, were a combination of undergraduate university students from the University of Tasmania and local community

members. Psychology undergraduate students were recruited from first year Psychology classes, and participated through the online research participation system, SONA. Non-psychology undergraduate students were recruited via visual advertisements promoted throughout the University (see Appendix B), and community members were recruited through social media outlets (i.e. Facebook; see Appendix C).

Ethics approval was obtained for this study from the Tasmanian Social Sciences Human Research Ethics Committee (Ethics reference number: H0017351; see Appendix A). A priori power analysis was conducted using G Power and it was found that to detect a medium effect, 400 participants were required for this study. The only restriction to recruitment was that all participants must have been over the age of 18. Table 1 includes all demographic data for all participants involved in this research.

Table 1.

Descriptives for Participant's Age, Gender, Ethnicity, and Previously Enrolled University Units

Characteristics	N= 145 (100%)
Age	
Mean *(SD)*	30.0 (*11.75*)
Gender	
Male	27 (18.6%)
Female	118 (81.4%)
Ethnicity	
Caucasian	122 (84.1%)
Aboriginal/ Torres Strait Islander	7 (4.8%)

Asian	13 (9.0)
Indian	2 (1.4%)
Sudanese	1 (0.7%)
Previously enrolled units	
KHA106- Brain, Mind and Emotion	32 (22.1%)
Any University level law units	23 (15.9)
Any University level neuroscience units	12 (8.3)

Materials and Design

This study employed a between groups design with three independent variables: MAOA gene (present vs absent), environmental trauma (present vs absent) and race (aboriginal vs Caucasian), resulting in eight conditions. Participants were presented an alternative version of the below vignette, which was modified for each level of the three independent variables.

Vignettes.

All participants read a fictional case summary concerning an individual who was being charged with common assault. All vignettes contained the same case description, concerning the physical altercation between defendant Scott and victim, Mark, that resulted in Mark becoming hospitalised and potentially suffering from permanent brain damage. Therefore, all participants' vignettes contained the same core information, but differed in regards to genetic (gene: present vs absent), environmental (trauma: present vs absent) and race (aboriginal vs Caucasian) evidence.

In all control conditions, the defence lawyer argued that the defendant did not intend to attack the stranger and only acted impulsively. When environmental trauma was

manipulated, the defendant was depicted as having experienced both physical abuse from his father from early childhood to adulthood (i.e. physically beaten with a belt or electrical cord) and maternal neglect and rejection from his mother. This defence was supported by expert testimony, stating that physical mistreatment causes severe dysregulation of one's emotions and behavioural impulses and therefore can heighten the risk of future aggressive, antisocial behaviour.

When genetic evidence was manipulated, the defendant was portrayed as pertaining a genetic susceptibility to aggressive violence. The expert witness for the defence testified that possession of the MAOA-L gene causes the dysregualtion of ones behavioural impulses. Consequently, this causes an individual to be more susceptible to aggressive outbursts, reactive violence, and antisocial criminal behaviour.

Furthermore, when a combination of both genetic and environmental trauma evidence was manipulated, the expert witness for the defence stated that when an individual is in possession of the MAOA-L gene and has experienced maltreatment, this further increases their risk of future aggressive, antisocial behaviour. For the full descriptions of each vignette, refer to Appendix F.

Manipulation Checks. The following manipulation checks were utilised in this study to determine the effectiveness of the experimental manipulations of race, gene and trauma. Participants were asked, "*What crime was Scott charged with",* and "*What was the name of the person Scott hurt?"* Failure to correctly respond to these questions resulted in the participant being removed from the analysis.

Public Understanding and Attitudes towards Genetics and Genomics Scale. (PUGGS; Carver, Castera, Gericke, Evangelista & El-Hani, 2017). Section 2 and 3 of the "Public Understanding and Attitudes towards Genetics and Genomics Scale" were used to measure participants' previous genetic knowledge (see Appendix H). This was included to

check participant knowledge, and to use as a potential covariate should there be differences between groups in terms of knowledge. Section 2 and 3 of the PUGGS questionnaire demonstrate good reliability and validity (Cronbach's alpha = 0.67; Carver et al., 2017).

Section 2 consisted of 16 items concerning participant's beliefs in genetic determinism. Participants were asked to indicate the degree in which they believe that genetics and the environment contribute to various traits (i.e. Bipolar disorder, political beliefs), with answers measured on a 5-Point Likert scale: (1 = Only environmental differences contribute to the trait, 2 = mainly environmental differences contribute to the trait, 3 = both environmental and genetic differences contribute to the trait, 4 = mainly genetic differences contribute to the trait, 5 = Only genetic differences contribute to the trait). More correct scores on section 2 of the PUGGS indicate greater knowledge.

Section 3 contained 9 items regarding participants' knowledge of the gene-environment interaction (i.e. most traits and diseases are caused by genes and environmental factors) and asked participants to indicate whether they thought the statement was True/False/I don't know. More correct scores indicate greater knowledge, with participants being categorised as either possessing high or low levels of knowledge.

Perception of Culpability. Participants were advised to answer four separate questions to assess their perceptions of the defendant's criminal culpability:

"*How likely do you think it is that he will commit a similar crime again?* (1 = very unlikely to 5 = very likely).

"*If you were to meet Scott, how scared would you feel?* (1 = very scared to 5 = not at all scared).

"*There are no excuses for Scott's behaviour*" (1= strongly agree to 5 = strongly disagree).

"Scott should be treated leniently as this was his first offence" (1= strongly disagree to 5= strongly agree).

"*It doesn't matter that this is Scott's first offence" (*1= strongly disagree to 5 = strongly agree).

Participants allocated to the trauma and trauma x gene condition were asked the following statement, "*The family violence Scott experiences as a child mean's he is less responsible than if there was no history of family violence."* (1= strongly disagree, to 5= strongly agree).

Those participants allocated to the gene and gene x trauma conditions were also asked, "*The fact that Scott has the version of the MAOA gene that is associated with impulsivity means he is less responsible than if he didn't have this gene."* (1= strongly disagree, to 5= strongly agree). They were also asked "*Given the evidence about the MAOA gene, do you think this person should be sentenced more or less harshly than if they did not have this gene?"* (1= a lot more harshly to 5= a lot less harshly). Participants were also asked "*Have you heard of the MAOA or 'Warrior' gene before?"* with response options being either "Yes" or "No" to assess their prior genetic knowledge.

Sentence severity. Participants were advised to answer four questions relating to the defendants sentence severity:

"Do you think Scott should be found guilty?", with response options being either "yes", or "no". Those participants who answered 'no' to this statement were redirected to the final question. Therefore, only those participants that responded with 'yes' to the first question were asked the following statement:

"What punishment do you think Scott deserves": Good behaviour bond (so will stay free, but if he commits another crime within 24 months, a penalty for this crime will be also

added), Fine (so will have to pay up to $2,800, but remain free), Imprisonment (will go to prison for a period of time), or none.

The third question was only provided to those who selected 'imprisonment' for the aforementioned question; therefore all other options selected redirected participants to the final question. *"If you selected imprisonment, how long do you think he should be imprisoned for?* (Note: the maximum length of time he could be imprisoned according to Tasmanian Law is 21 years)" and advised participants to answer by selecting a response option of, ranging from <1 year, to a maximum of 21 years.

Finally, participants were asked, "*Do you think it would be appropriate to offer rehabilitation services such as counselling?",* with response options being either "yes" or "no".

Procedure

Undergraduate Psychology students registered for the study through SONA, and participants from the broader community were directed to the online survey via the link provided on the advertisements. Participants were provided with an information sheet, which described the study and informed participants that the study involved descriptions of violence (see Appendix D). Participants were provided with an online consent questionnaire (see Appendix E). Participants were then instructed to provide their demographic information, including their age, gender, and ethnicity (see Appendix G). Furthermore, participants were asked to specify if they had any previous enrolment in KHA106 Brain, Mind and Emotion, any Law or Neuroscience University units, as any prior genetics and legal knowledge has the potential to influence results.

Participants were randomly assigned by computer generation to one of the 8 experimental conditions, where in which they were instructed to carefully read the hypothetical case trial vignette. Each vignette contained the description of a defendant being

charged with common assault. Participants were then advised to answer the two manipulation check questions, relating to the material they had previously read in the vignette. Participants who failed to correctly answer the manipulation check questions were removed from the analysis. Participants were then advised to answer numerous questions to assess the dependent variables of the study, which included: perception of criminal culpability and sentence severity.

Following the completion of the vignette, manipulation check and dependent variable questions, participants were required to complete section 2 and 3 of the PUGGS (Carver et al., 2017) self report questionnaire.

After completion of the survey, all first-year undergraduate psychology students received 45 minutes of course credit for participating in this research**.** The remaining participants who wished to go into the draw to receive one of four $50.00 Coles/Myer gift vouchers were directed to a separate survey link, where participant's name and contact details (which were not linked to survey data) were collected.

Data Analysis

Participant perceptions of defendant culpability and sentence severity were utilised as dependant variables. Multiple 2 (gene: present vs absent) x 2 (trauma: present vs absent) x 2 (race: Caucasian vs aboriginal) Analyses of Variance (ANOVAs) were conducted. Group differences on the PUGGS (sections 2 & 3) and age were also explored, to determine if they were required as covariates in the final analyses.

Results

Data Screening and Analysis

A total of 262 people attempted to participate in the online survey, and those who failed manipulation checks (n= 52) or who did not complete the survey (n=65) were removed from the analysis. Data analysis was completed on all 145 participants. Outliers were defined

as data points greater or less than 3.29 SDs from the mean (Tabachnick & Fidell, 2007). Inspection of the dataset revealed the presence of two outliers in the prison length data. Removal of the data points indicated no impact on the results; therefore they remained in the final analysis. Data screening revealed a positive skew (skewness = 2.10, *SE* = .33) in the prison sentence data. However, as ANOVAs are robust to normality violations (Field, 2013), and that prison length is an indicator of participant's natural tendencies around sentencing, no further adjustments were undertaken. The homogeneity of variance assumptions were also inspected, and revealed violations in the 'prison length' and 'PUGGS3 total' analyses. Therefore, due to unequal sample sizes, the Brown-Forsythe F ratios were used.

Results

One-way between groups analysis of variance (ANOVAs) were conducted to examine the group differences in age and general understanding of genetic information (PUGGS2 & PUGGS3). There were no significant group differences for age, F (7, 137) = 1.24, p = .286 and PUGGS3, F (7, 101.5) = 2.07 p = .054. However, there was a significant difference in PUGGS2 scores between groups, F (7, 119) = 2.17 p = .041. Further examination of the pairwise comparisons using Games-Howell post hocs as recommended by Field (2013) when using unequal groups, revealed no differences between groups. Furthermore, chi-square analyses revealed no significant group differences for gender, χ^2 (7) = 8.10, p = .324, V =.236 and participants prior MAOA genetic knowledge, χ^2 (14) = 14.15, p = .439, V=.226. Therefore, age, PUGGS (sections 2 & 3) and gender scores were not used as covariates in the final analyses.

Effect of Defendant Characteristics on Sentence Severity Judgements

A series of 2 (gene: present vs absent) x 2(trauma: present vs absent) x 2(race: Caucasian vs aboriginal) ANOVAs were conducted to determine if defendant characteristics

impacted on length of prison sentence decisions. There were no significant effects, F (1, 54) = .073, p = .788, ηp2= .001.

Analysis revealed a significant main effect of genetics on length of prison sentence decisions, F (1, 54) = 6.16, p = .016, ηp2= .102. Specifically, when presented with the genetic explanation, participants on average recommended a 2-year sentence, whilst in contrast, without the genetic explanation, participants offered a 5-year sentence. However, there were no significant main effects of trauma and race on length of prison sentence decisions (see Appendix I for output).

Chi-square analyses were conducted to assess whether there were any associations between the defendant characteristics and sentence severity dependent variables (guilt, punishment & rehabilitation). Results demonstrated no significant associations across conditions, as demonstrated in Tables 2 and 3.

Table 2.

Chi Square for Sentence Severity Dependent Variables for Aboriginal Conditions

		Control (n = 18)	Trauma (n = 10)	Gene (n =18)	Gene x trauma (n =21)	χ^2	p	V
Guilty	Yes	17(94.4%)	10(100.0%)	18(100.0%)	19(90.5%)	6.85	.445	.219
	No	1 (5.6%)	0 (0.0%)	0(0.0%)	2(9.5%)			
Punishment	Good behaviour bond	5 (29.4%)	4 (40.0%)	7 (38.9%)	5 (26.3%)	9.11	.824	.183
	Fine	2 (11.8%)	1 (10.0%)	3 (16.7%)	6 (31.6%)			
	Imprisonment	10 (58.8%)	5 (50%)	8 (44.4%)	8 (42.1%)			
	None	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)			
Rehabilitation	Yes	16 (94.1%)	10 (100.0%)	18 (100.0%)	16 (80.0%)	12.32	.091	.298
	No	1 (5.9%)	0 (0%)	0 (0.0%)	4 (20.0%)			

Note: Guilty = *"Do you think Scott should be found guilty?"*; Punishment = "*What punishment do you think Scott deserves?"*; Rehabilitation = *Do you think it would be appropriate to offer rehabilitation services?*

Table 3.

Chi Square for Sentence Severity Dependent Variables for Caucasian Conditions

		Control (n = 19)	Trauma (n = 22)	Gene (n = 18)	Gene x trauma (n = 17)	χ^2	p	V
Guilty	Yes	19 (100.0%)	22 (100.0%)	16 (88.9%)	16 (94.1%)	6.85	.445	.219
	No	0 (0.0%)	0 (0.0%)	2 (11.1%)	1 (5.9%)			
Punishment	Good behaviour bond	7 (38.9%)	7 (31.8%)	7 (43.8%)	6 (37.5%)	9.11	.824	.183
	Fine	1 (5.6%)	3 (13.6%)	1 (6.2%)	4 (25.0%)			
	Imprisonment	10 (55.6%)	12 (54.5%)	8 (50.0%)	6 (37.5%)			
	None	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)			
Rehabilitation	Yes	16 (88.9%)	20 (95.2%)	18 (100.0%)	17 (100.0%)	12.32	.091	.298
	No	2 (11.1%)	1 (4.8%)	0 (0.0%)	0 (0.0%)			

Note: Guilty = "*Do you think Scott should be found guilty?"*; Punishment = *"What punishment do you think Scott deserves?";* Rehabilitation = *"Do you think it would be appropriate to offer rehabilitative services?"*

Effect of Defendant Characteristics on Criminal Culpability Judgements

A series of 2 (gene: present vs absent) x 2 (trauma: present vs absent) x 2 (race: Caucasian vs aboriginal) ANOVAs were conducted on each culpability dependent variable. Descriptions of the multiple culpability measures utilised in this research are presented in Table 4. Overall, analyses revealed no significant main effects or interactions of defendant characteristics on juror's criminal culpability judgements, (p>.05, Please see Appendix I for output).

Table 4.
Description of Culpability Dependent Variables

Dependent Variables	5-point Likert scale
How likely do you think it is that Scott will commit a similar crime again?	1= Very unlikely, 5= Very likely
If you were to meet Scott, how scared would you feel?	1= Very scared, 5= Not at all scared
There are no excuses for Scott's behaviour	1= Strongly disagree, 5= Strongly agree
Scott should be treated leniently as this was his first offence	1= Strongly disagree, 5= Strongly agree
It doesn't matter that this is Scott's first offence	1= Strongly disagree, 5= Strongly agree
The family violence Scott's experiences as a child means he is less responsible than if there was no history of family violence*	1= Strongly disagree, 5= Strongly agree
The fact that Scott has the version of the MAOA gene that is associated with impulsivity means he is less responsible than if he didn't have this gene**	1= Strongly disagree, 5= Strongly agree
Given the evidence about the MAOA gene, do you think this person should be sentenced more or less harshly than if they did not have this gene?**	1= A lot more harshly, 5= A lot less harshly

*only shown in the trauma present conditions

** only shown in the gene present conditions

Discussion

The aim of the current study was to provide an examination of whether or not introducing MAOA genetic evidence into criminal trial proceedings influences perceptions of defendant culpability or severity of sentence. Further, the interaction between genetic, environmental trauma and racial defendant characteristics was explored. The results of the present study provide partial support for the first hypothesis. Results indicated that when the MAOA genetic explanation of the defendant's behaviour was applied, this produced a reduction in juror's length of imprisonment sentence severity judgements. However in relation to the second hypothesis, results demonstrated an absence of an influence of MAOA genetic, environmental trauma and racial defendant characteristics on juror's culpability and sentence severity determinations.

MAOA Genetic Evidence on Judicial Culpability and Sentence Severity Judgements

The first hypothesis predicted a reduction in perceived criminal culpability and sentence severity outcomes when the MAOA genetic explanation of the defendant's behaviour was applied. This hypothesis was partially supported by the results as the presentation of the MAOA genetic explanation of the defendant's behaviour reduced juror's sentence length decisions. However, the MAOA genetic explanation of defendant behaviour did not impact on juror's culpability judgements or the remaining sentence severity measures of punishment, guilt and rehabilitation. Nevertheless, the present finding is noteworthy as it has the potential to produce several implications for the defendant's sentencing outcomes.

As the present finding demonstrated, when mock jurors were presented with the MAOA genetic explanation of the defendant's behaviour, on average, they rendered a 2 year sentence, compared to mock jurors who imposed a 5 year sentence in the absence of a genetic explanation. The mitigating influence of MAOA genetic evidence on juror's sentence length

decisions naturally provokes the question as to why it specifically only impacted on sentence length decisions, and not the remaining sentence severity judgements. A possible explanation may be the contrasting nature of the sentence severity measures response option structures. The sentence severity measures of guilt, punishment and rehabilitation were provided in a dichotomous (i.e. “yes or no”; “punishment”: fine, behaviour bond, imprisonment, none) format, whilst in contrast, the prison length measure allowed for graded response options, i.e. ‘1-21 years’.

It is possible that allowing mock jurors to specify the length of the defendant’s prison term uncovered their subtle attitudes that could not be directly reflected by the dichotomous sentence severity response options. Before proceeding further, it is important to emphasise that in real world criminal trial proceedings, jurors are not responsible for making sentence decisions for criminal offences. However, the utilisation of the prison length severity measure in the present research was implemented to explore public attitudes regarding the influence of genetics evidence on judicial decision-making processes. Therefore, in consideration of this, perhaps the sensitivity of the prison length measure allowed for a more thorough detection of the impact of genetic evidence on mock jurors attitudes, than what was originally provided by the dichotomous determinations of guilt, punishment and rehabilitation.

Similar findings are reported by Aspinwall et al. (2012), whose research identified the mitigating influence of MAOA genetic evidence on judges sentencing determinations. Therefore, the present findings and those of Aspinwall et al. (2012) illustrate the potential importance of genetic evidence for legal defence teams, as prison length outcomes are ideally the most important sentencing decision for the defendant. Therefore, if there is a potential of a mitigating influence of MAOA genetic evidence on prison length determinations, this may be of valuable use for defence attorney’s defence strategies that typically revolve around exculpation or leniency of the defendant’s sentence.

Such findings of a mitigating influence of MAOA genetic evidence on judicial sentence length determinations can be explained by Stevenson et al.'s (2010) attribution theory. The attribution theory contends that the varying types of ascriptions jurors or judges make regarding the cause of a crime, influence their judgements concerning the degree of the defendant's criminal responsibility (Stevenson et al., 2010). Theoretically, it is asserted that legal professionals will impose more punitive sentencing outcomes when the nature of the criminal offense is perceived to have been manageable and stable, in contrast to being irrepressible and unpredictable (Sandys, Pruss & Walsh, 2009). In accordance with this theoretical justification, in the present study, when the defendant was presented as having a genetic predisposition to engage in impulsive violence, this elicited mitigating reactions in mock jurors. By framing the defendant's involvement in the crime as being unintentional, and as a direct consequence of a genetic susceptibility to aggression, mock jurors were more inclined to make uncontrollable and unpredictable causal attributions. This may explain why in the present study mock jurors were more inclined to perceive the MAOA genetic explanation of the defendant's behaviour as a warrant for a reduction of the defendant's sentence length.

Consequently, the present findings illustrating the mitigating influence of the MAOA genetic explanation of the defendant's behaviour may be of value for legal defence team strategies. For example, defence attorneys may be inclined to use such mitigating MAOA genetic evidence during capital sentence hearings to bolster their argument that the defendant acted involuntarily in the commission of the criminal offense. The use of the MAOA genetic explanation by the criminal defence may potentially persuade jurors to perceive the defendant's genetic susceptibility to impulsive violence as worthy for a reduction in their criminal culpability and sentence length outcomes. Thus, although the present findings are

preliminary, they offer unique insight regarding the potential mitigating influence of MAOA genetic evidence on judicial sentencing determinations.

MAOA Genetic, Trauma and Race Evidence on Judicial Culpability and Sentence Severity Judgements

The second aim of this study was to examine the cumulative influence of MAOA gene, environmental trauma and racial defendant characteristics on judicial culpability and severity of sentence determinations. Contrary to hypotheses, the results of the present research demonstrated an absence of an interactive effect of defendant characteristics on judicial culpability and sentencing decisions. Despite this overall finding, this study is the first (to the authors best knowledge) to explore the possible interaction between defendant's MAOA genetic status, environmental trauma and Indigenous status characteristics on criminal trial outcomes, and thus offers a novel finding.

The free will and genetic determinism perspectives can offer theoretical explanations for an absence of an interactive influence of defendant's characteristics on juror's culpability and sentencing assessments. Believers of free will and moral responsibility adopt the conception that the criminal actor is free and autonomous, and therefore, possess retributive attitudes to criminal punishment (Jones, 2003). As a result, juror's who possess greater free will attributions will be more inclined to discount the biopsychosocial causal explanations of criminal behaviour (Gordon & Green, 2018). In opposition, genetic determinists maintain that human behaviour is significantly influenced by biological and environmental factors (Jones, 2003). Therefore, juror's adopting the genetic determinism approach are more receptive to biopsychosocial explanations that appeal to the role of situational factors in fostering antisocial, criminal behaviour (Stevenson et al., 2010).

Thus, the absence of an interactive influence of defendant characteristics on culpability and sentencing decisions in the present study could be attributed to mock juror's

strong internalised attitudes of free will. Mock jurors who possessed strong free will attributions may have been less receptive to the behavioural genetic explanations, and thus discounted the causal role of the MAOA gene and maltreatment history in the provocation of the defendant's criminal behaviour. Consequently, jurors who fail to accept the criminogenic impacts of MAOA gene possession and maltreatment exposure, will more likely be impervious to mitigation arguments that appeal to the causal role of those factors in provoking the defendant's criminal behaviour. Additionally, jurors may have acknowledged that genetics and environmental trauma may bear some influence on criminal behaviour, but still believe that the criminal actor should exercise sufficient control in order to conform to societal norms and the law, even if for some individuals, that requires a stronger exertion of control (Appelbaum, Scurich & Raad, 2015).

An additional possibility is that the mock juror's in the present study may have not fully comprehended the complexities of genetic and childhood maltreatment evidence, and therefore disregarded it when evaluating the defendant's criminal liability and sentencing outcomes. This notion is supported by the work of Scurich and Appelbaum (2017) who contend that lay people may possess an oversimplified understanding of behavioural genetics information, which consequently provokes the dismissal of behavioural genetic explanations in criminal trial proceedings.

A final explanation may be that the presentation of both a genetic and environmental explanation of the defendant's behaviour provoked countervailing judgements in mock jurors (Aspinwall et al., 2012). More specifically, the behavioural genetic explanations of the defendant's behaviour may have induced both the perception that the defendant is less blameworthy and responsible for the crime, but also, that they are more likely to commit such offenses in the future (Scurich & Appelbaum, 2017). Thus, in alignment with the present

research findings, the overall effect of both genetic and environmental explanations may be null.

Overall, it can be speculated that the results of this study may suggest that mock jurors may be in agreement with legal scholars who assert that behavioural genetics evidence will have a minimal (if any) effect on judiciary determinations of liability and punishment (Atiq, 2013). Legal commentary asserts that the genetic and environmental explanation of an increased vulnerability to aggressive, antisocial behaviour, is an insufficient foundation on which to base claims of diminished liability (Jones, 2003). They contend that traditionally, the law requires the existence of either diminished rationalism or behavioural control as a firm indicator of reduced criminal culpability (Appelbaum & Scurich, 2014). Therefore, for behavioural genetics evidence to be a persuasive mitigation strategy in reducing criminal liability, it must clearly demonstrate its role in diminishing the defendant's rationality and control over their behavioural impulsivity. Consequently, in the current research and in that of Costa, Pate and Gibson (2017) the interactive effect of defendant characteristics failed to exert such an influence, and thus purported claims of its efficacy as a mitigation strategy were not supported by the present findings.

Interestingly, this may potentially change as this area of research starts to evolve and implements sophisticated, ecologically valid designs. As behavioural genetics research continues to advance, it will further discern how genotype and environmental factors predispose individuals to aggressive, criminal behaviour, and is likely to gain more media attention, thus becoming better known in the general public. Therefore, as behavioural genetics research continues to provide greater specificity on the mechanisms of genetic and environmental predispositions, adjudicators will be less able to disregard such causal explanations of criminal behaviour (Denno, 2011), and may mitigate or aggravate judicial sentencing judgements.

There are various possible explanations regarding the absence of an impact of the defendant's Indigeneity (when in both the presence and absence of behavioural genetics evidence) on judicial sentencing decisions. Based on previous Australian sentencing literature (Bond & Jeffries, 2011; Snowball & Weatherburn, 2006), it is possible that once other sentencing determinants are controlled for (i.e. heinousness of the crime and past criminal history), Indigenous status has no direct effect on judicial sentencing decisions. Alternatively, it is possible that the experimental conditions in the present research that manipulated the defendant's race as being 'aboriginal', provoked social desirability responding in mock juror participants. It is possible that participants were conscious of their own innate biases, and such awareness of the saliency of race in this research influenced their responses (Sood**,** 2014).

Furthermore, there is a possibility that the Indigenous status of Australian defendants does not elicit that same level of hostility and apprehension amongst Australian community members, that black, male defendants provoke in America (Snowball & Weatherburn, 2006). As suggested by Snowball and Weatherburn (2006), this could be a result of how Indigenous Australian males only comprise 1% of the general population, and commonly direct their violent behaviour towards other aboriginal individuals (i.e. women and girls) outside the major Australian population areas. Moreover, as Australian sentencing research has produced mixed findings across jurisdictions (Bond & Jeffries, 2011; Jeffries & Bond, 2009; Snowball & Weatherburn, 2006) there may be a possibility that the Tasmanian population (who comprised the pool of mock jurors in the present research) possess differing attitudes towards Indigenous Australians, compared to the greater Indigenous Australian populated areas of NSW, Queensland, Western Australia and the Northern Territory. It is reported that Tasmania has the lowest rate of Indigenous Australian incarceration compared to all other Australian states, at 703 per 100,000 Aboriginal and Torres Strait Islander adult population (Australian

Bureau of Statistics, 2017). In consideration of this information, the potential for the Tasmanian population to possess differing attitudes could be a result of the underrepresentation of Indigenous Australians in Tasmania compared to other states. As a result, perhaps the reduced visible presence of Indigenous Australians in the Tasmanian community produces variations in attitudes, and may have operated as an influencing factor in the present research.

The current research can be considered from the perspective of the racial threat theory. The racial threat perspective contends that the sanctions imposed by the criminal justice system are designed to control racial minority groups that serve as a potential threat to the dominant Caucasian social group (Steen, Engen & Gainey, 2005). Following this perspective, it is argued that members of the dominant Anglo-Australian social class typically associate racial and ethnic minority members with the negative preconceived stereotypes of threat and criminality (Brennan & Spohn, 2009). Consequently, the racial threat perspective explains how social control practices inflicted on racial minority groups may elicit disparities in criminal justice sentencing outcomes (Steen et al., 2005). The present research findings fail to provide empirical support for the racial threat perspective. As previously stated, perhaps as a result of the reduced visible presence of Indigenous Australians in Tasmania, Indigeneity status of the defendant in the present research did not elicit heightened reactions of fear and hostility in the mock jurors. Perhaps in Australia, those stereotypes of fear and dangerousness commonly associated with racial minorities, do not as strongly guide judicial evaluations of Indigenous defendant blameworthiness and threat that racial threat theorists so strongly assert in North American research (Snowball & Weatherburn, 2006). Thus, the present research findings do not provide supportive evidence for the racial threat perspective concerning the racially differential treatment of minority defendants in criminal trial proceedings.

Strengths and Limitations

A strength of this thesis is the employment of an Australian sample. Previous literature relating to the application of behavioural genetics evidence have commonly utilised American samples. Consequently, this research is the first (to the researchers knowledge) to experimentally examine the cumulative influence of a defendant's behavioural genetics and Australian Indigeneity status on criminal trial outcomes, and thus, greatly compliments a steadily growing area of research. Indeed, the further accumulation of worldwide samples will provide comparative data to assess the efficacy of the utilisation of behavioural genetics evidence in other international criminal justice systems.

Secondly, this study included both university students and local community members, and thus was able to accumulate a diverse range of mock juror attitudes and case judgements. Therefore, this study's diverse sample demonstrates a more realistic representation of the potential jury pool in Australian courts, and thus strengthens the external validity of our research.

A third strength of the present research was the utilisation of multiple culpability measures. This provided a more in-depth exploration of mock juror's perceptions regarding the defendant's criminal liability. Moreover, in contrast to previous research that has explored the application of MAOA genetic evidence in capital trials (Appelbaum & Scurich, 2014; Costa et al., 2017), this present research provides unique insight of jurors sentencing decisions in noncapital legal proceedings.

There are also some limitations of this research. Firstly, we recruited fewer participants than originally intended ($N = 400$), which resulted in reduced statistical power. From the results, it is evident that the final recruitment of 145 participants lowered the power of this study, and may have undermined its ability to detect a reliable effect.

A second limitation of this study is one that is commonly associated with the use of online surveys. In the absence of direct observation, online surveys produce issues relating to

inaccurate responding and the misinterpretation of questions. However, research advises that online surveys demonstrate strong internal consistency and high test-retest reliability, and thus yield results comparable with traditional survey methods (Costa et al., 2017). To reduce such concerns, several manipulation check questions were included in this study's online survey. Participants who failed the manipulation checks were removed from the study.

It is important to acknowledge that the ecological validity of this study was minimised due to the use of relatively brief, written vignettes. Although allowing for the opportunity to determine cause and effect conclusions concerning the targeted variables, written vignettes responded to online might arouse different responses in jurors in contrast to realistic trial testimonies (Appelbaum et al., 2015). It is unknown whether participants would have responded differently to real-world oral trial presentations or to vignettes containing different content (i.e. changing the descriptions of the victims, perpetrators or expert witnesses). Therefore, we cannot eliminate the possibility that the manipulations included in this study were less impactful than real-world trial testimony or different case vignettes.

A final limitation to be considered in the present study was the utilisation of a punishment variable. Mock jurors in this study were asked to indicate what punishment they believe the defendant should receive (i.e. imprisonment, fine, good behaviour bond, no punishment). However, real world jurors are not responsible for determining what punishment the defendant should obtain, they are solely responsible for determining a guilt verdict. However, this variable was implemented in the current study to offer an in-depth examination and understanding of juror's perceptions of defendant culpability, that are not offered by a dichotomous guilt measure.

Summary, Recommendations and Conclusion

In conclusion, the current study examined the influence of MAOA genetic evidence on judicial culpability and sentence severity judgements. Further, the interaction between

genetic, environmental trauma and racial defendant characteristics was explored. Overall, results demonstrated no interaction between MAOA genetics, environmental trauma and Indigeneity status defendant characteristics on judicial culpability and sentence severity determinations. However, there was a modest effect of MAOA genetic evidence on the prison length sentence severity measure. Taken together, this study provides unique evidence of the influence of behavioural genetics and Indigeneity status on culpability and sentencing judgements in an Australian context, and presented several notable implications for legal teams defence strategies.

There are various directions for future research exploring the impact of behavioural genetics evidence and racial defendant characteristics on judiciary sentencing decisions. Future research on the utilisation of genetic and environmental evidence in criminal trials should endeavour to use large, representative samples, and incorporate specifically tailored research designs that appropriately reflect realistic courtroom processes. This may include live oral presentations from either opposing counsel, or pre-recorded testimonies by real or simulated expert witnesses, to further enhance the ecological validity of future research in this field.

Furthermore, future research can explore the impact of behavioural genetics in other adjudicatory settings (i.e. juvenile court contexts or disciplinary hearings). Although only speculative, in contexts where criminal punishment is not the primary consideration, defence attorney's mitigating arguments that incorporate behavioural genetics evidence may alter judiciary sentencing decisions (Costa et al., 2017). Moreover, future research should endeavour to further expand on the present research, as it involved a non-capital legal trial (i.e. common assault). To date, most research involving the application of behavioural genetics in court has focussed exclusively on capital murder trials (Denno, 2011). Therefore, future research focussing attention on non-capital criminal proceedings may potentially

establish a stronger impact of behavioural genetics evidence on juror's culpability judgements, as the defendant has a greater likelihood to be released from prison and re-established back into society.

Additionally, incorporating instructions detailing the rules regarding how jurors determine criminal sentence outcomes when presented with behavioural genetics evidence by legal practitioners will identify the extent to which jurors understand behavioural genetics evidence. Moreover, it will allow for the assessment of how instructions influence juror's culpability and sentencing judgements (Appelbaum, Scurich & Raad, 2015).

Furthermore, future research could allow for the further exploration of supplementary research questions, regarding the moderating influence of other extra-legal variables. For example, including details of the heinousness of the crime, and the defendant's extensive criminal history, with a behavioural genetic vulnerability to antisocial behaviour, this may heighten jurors fear and apprehension towards the defendant. Consequently, this could produce further differing results in a racial context, as previous research has found that Indigenous status and extra legal factors aggravate juror's culpability and sentencing decisions (Jeffries & Bond, 2009).

This suggestion provokes the further exploration of whether the cumulative effect of behavioural genetics and racial defendant characteristics can operate as a 'double edged sword' in criminal trials (Aspinwall et al., 2012). It may be that when the prosecution presents such a combination of evidence that it will operate as an aggravating factor, resulting in punitive sentencing outcomes. Whilst the defence can reposition the causality of the defendant's behaviour from their own free will towards a genetic vulnerability to aggressive violence, the prosecution can alternatively argue that the defendant is immutable and will always serve as a threat to society, unless imprisoned.

Conclusively, the present research findings demonstrated an absence of an interaction between MAOA genetics, environmental trauma and Indigenous status defendant characteristics on judicial culpability and sentencing determinations. Although there was a modest effect of MAOA genetic evidence on jurors prison length decisions, confirmatory studies are required to further validate this finding. Overall, the present research findings are consistent with previous research conclusions that the increasing resort to behavioural genetics evidence as a defence mitigation strategy may not produce the desired sentencing outcomes for their criminal defendant.

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Appendices

Appendix A

Ethics Approval

Social Science Ethics Officer
Private Bag 01 Hobart
Tasmania 7001 Australia
Tel: (03) 6226 2763
Fax: (03) 6226 7148
Katherine.Shaw@utas.edu.au

HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

31 May 2018

Ms Christine Padgett
Psychology
Private Bag 1342

Dear Ms Padgett

Re: MINIMAL RISK ETHICS APPLICATION APPROVAL
Ethics Ref: H0017351 - The Influence of Juror and Defendant Characteristics on Criminal Trial Outcomes

We are pleased to advise that acting on a mandate from the Tasmania Social Sciences HREC, the Chair of the committee considered and approved the above project on 31 May 2018.

This approval constitutes ethical clearance by the Tasmania Social Sciences Human Research Ethics Committee. The decision and authority to commence the associated research may be dependent on factors beyond the remit of the ethics review process. For example, your research may need ethics clearance from other organisations or review by your research governance coordinator or Head of Department. It is your responsibility to find out if the approval of other bodies or authorities is required. It is recommended that the proposed research should not commence until you have satisfied these requirements.

Please note that this approval is for four years and is conditional upon receipt of an annual Progress Report. Ethics approval for this project will lapse if a Progress Report is not submitted.

The following conditions apply to this approval. Failure to abide by these conditions may result in suspension or discontinuation of approval.

1. It is the responsibility of the Chief Investigator to ensure that all investigators are aware of the terms of approval, to ensure the project is conducted as approved by the Ethics Committee, and to notify the Committee if any investigators are added to, or cease involvement with, the project.

2. Complaints: If any complaints are received or ethical issues arise during the course of the project, investigators should advise the Executive Officer of the Ethics Committee on 03 6226 7479 or human.ethics@utas.edu.au.

3. Incidents or adverse effects: Investigators should notify the Ethics Committee immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.

4. Amendments to Project: Modifications to the project must not proceed until approval is obtained from the Ethics Committee. Please submit an Amendment Form (available on our website) to notify the Ethics Committee of the proposed modifications.

5. Annual Report: Continued approval for this project is dependent on the submission of a Progress Report by the anniversary date of your approval. You will be sent a courtesy reminder closer to this date. **Failure to submit a Progress Report will mean that ethics approval for this project will lapse.**

6. Final Report: A Final Report and a copy of any published material arising from the project, either in full or abstract, must be provided at the end of the project.

Yours sincerely

Jude Vienna-Hallam
Acting Executive Officer
Tasmania Social Sciences HREC

Appendix B

Participant Recruitment Flyer

The Influence of Juror and Defendant Characteristics on Criminal Trial Outcomes

You are invited to participate

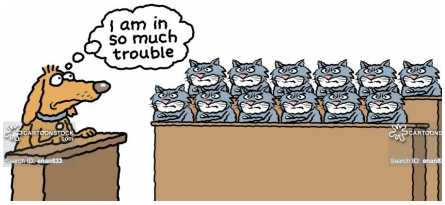
in a study examining the influence of juror and offender characteristics on criminal trial outcomes.

This study will involve completing an online survey asking a series of questions relating to a hypothetical court case scenario, and is being conducted as part of a psychology honours project, supervised by Dr. Christine Padgett.

The survey, along with further information can be found at the following link, and is expected to take approximately **45** minutes to complete, (https://www.surveymonkey.com/r/YKD3K8R).

After completion of this survey you can go into the running to win a $50 Coles/Myer voucher, or first year psychology students and obtain 45 minutes research participation credit

Any questions relating this this study please contact Christine Padgett (Christine.Padgett@utas.edu.au), Kira Geard (kirag@utas.edu.au), or Isabelle Brighella (ib1@utas.edu.au)



http: Kira Geard (kirag@utas.edu.au) Isabelle Brighella (ib1@utas.edu.au)	http: Kira Geard (kirag@utas.edu.au) Isabelle Brighella (ib1@utas.edu.au)	http: Kira Geard (kirag@utas.edu.au) Isabelle Brighella (ib1@utas.edu.au)	http: Kira Geard (kirag@utas.edu.au) Isabelle Brighella (ib1@utas.edu.au)	http: Kira Geard (kirag@utas.edu.au) Isabelle Brighella (ib1@utas.edu.au)	http: Kira Geard (kirag@utas.edu.au) Isabelle Brighella (ib1@utas.edu.au)	http: Kira Geard (kirag@utas.edu.au) Isabelle Brighella (ib1@utas.edu.au)	http: Kira Geard (kirag@utas.edu.au) Isabelle Brighella (ib1@utas.edu.au)	http: Kira Geard (kirag@utas.edu.au) Isabelle Brighella (ib1@utas.edu.au)

Appendix C

Online Recruitment Advertisement

You are invited to participate in an anonymous online survey examining the influence of juror and defendant characteristics on criminal trial outcomes.

This study is being conducted by researchers at the University of Tasmania, and takes around **45 minutes** to complete. On completion of the survey you can go into the running to receive a $50 gift voucher (OR if you are a first-year psychology student at the University of Tasmania, you can choose between going into the running to receive a voucher, or **45 minutes** of course credit).

Ethics approval: H0017351

For more information, and to complete the survey, please follow this link.

https://www.surveymonkey.com/r/YKD3K8R

Appendix D

Participant Information Sheet

The Influence of Juror and Defendant Characteristics on Criminal Trial Outcomes

Invitation

You are invited to participate in a study examining the influence of juror and defendant characteristics on criminal trial outcomes. This study is being conducted as part of honours research projects by Isabelle Brighella and Kira Geard under the supervision of Dr Christine Padgett, from the School of Medicine (Psychology) at the University of Tasmania. Before you decide to participate in this research, it is essential that you are aware of why the research is being conducted, and what is required of your participation in this study. Please take the time to carefully read the information provided, and feel free to ask any questions if necessary.

What is the purpose of this study?

The purpose of this study is to explore the influence of offender and juror characteristics on criminal trial outcomes.

Why have I been invited to participate?

You are eligible to participate in this study because you're either an undergraduate UTAS student, or a member from the general population over the age of 18. Participation in this study is completely voluntary and there will be no consequence for individuals who do not wish to participate in this study.

What will I be asked to do?

This is an online study that will begin with you providing your informed consent. If you consent to participate, you will be asked to compete a brief demographics questionnaire, including questions about your age, gender and ethnicity. You will be then be asked to read a hypothetical trial scenario that describes a physical assault charge, and answer questions relating to the trial, as well as other questions relating to your own beliefs about human behaviour in general. Taking part in this survey will take approximately 45 minutes, and all data are anonymous.

Are there any possible benefits from participation in this study?

It is not anticipated that your involvement in this study will result in any direct benefits. However, the data collected from this research will provide further understanding of how offender and juror characteristics influence criminal sentencing decisions.
After completing this study, non-psychology undergraduates and members of the general public will have the opportunity to go into the draw to win a $50 Coles/Myer gift voucher. First year psychology undergraduates from UTAS will be provided with the choice to either enter the gift voucher draw or receive 45 minute research participation course credit via SONA for their involvement in this study.

Are there any possible risks from participation in this study?

There are no anticipated risks of participating in this study. However, as there is some description of violence. If you feel discomfort at any point during the study, please stop

immediately. If needed, there are phone support services available such as Lifeline (13 11 14) or Beyond Blue (1300 224 636), and UTas students have access to UTas counselling services (http://www.utas.edu.au/students/shw/counselling).

What if I change my mind during or after the study?

Your involvement in this study is completely voluntary. While we would be pleased to have you participate in this study, we respect your right to decline. If you decide to discontinue participation at any time throughout this study, there will be no consequences and you may do so without specifying an explanation. Withdrawing consent to participate in this study will not affect your relationship with the University of Tasmania. All information will be managed in a confidential manner, and your name will not be affiliated with any publications of this research.

What will happen to the information when this study is over?

All data that is collected from this study will be safely secured and kept confidential. It will be securely saved on a password-protected server in the School of Psychology. In accordance with National Ethics standards, all research data collected for this study will be kept for a minimum of 5 years following the date of first publication. After this period of time, all data will be deleted.

How will the results of the study be published?

As this research is part of a study for honours projects, the relevant findings will be reported in honours theses. No participants will be identified in this research publication. If you would like to receive a copy of the results of the research, please inform the investigators.

What if I have questions about this study?

If you have any questions or require further information regarding this study, please feel free to contact the research team involved:

- Dr Christine Padgett: Email: Christine.padgett@utas.edu.au or phone 6226 5718
- Isabelle Brighella: Email: ib1@utas.edu.au
- Kira Geard: Email: kirag@utas.edu.au.

This study has been approved by the Tasmanian Social Sciences Human Research Ethics Committee. If you have concerns or complaints about the conduct of this study, please contact the Executive Officer of the HREC (Tasmania) Network on +61 3 6226 6254 or email human.ethics@utas.edu.au. The Executive Officer is the person nominated to receive complaints from research participants. Please quote ethics reference number [H0017351].

Thank you for taking the time to read this information sheet, and your interest in this study. This information sheet is for you to keep. If you do wish to take part within this study, you will be required to fill out an informed consent form online prior to taking part in the study. By submitting the consent form, this will indicate that you agree to participate in this study.

Appendix E

Participant Consent Form

The Influence of Juror and Defendant Characteristics on Criminal Trial Outcomes

Participant Consent Form

1. I agree to take part in the research study named above.
2. I have read and understood the Information Sheet for this study.
3. The nature and possible effects of the study have been explained to me.
4. I understand that this study involves taking part in an online survey, where I will be asked to read a description about a hypothetical criminal trial scenario, and that I will then answer a series of questions.
5. I understand that all research data will be securely stored on the University of Tasmania premises for five years from the publication of the study results, and will then be destroyed
6. Any questions that I have asked have been answered to my satisfaction.
7. I understand that the researcher(s) will maintain confidentiality and that any information I supply to the researcher(s) will be used only for the purposes of the research.
8. I understand that the results of the study will be published so that I cannot be identified as a participant.
9. I understand that my participation is voluntary and that I may withdraw at any time during the survey without any effect. I understand that I will not be able to withdraw my data after completing the survey as it has been collected anonymously.

Please select your choice below. You may print a copy of this consent form for your records.

Clicking on the “Agree” button indicates that:

- You have read and understand the above information
- You voluntarily agree to participate
- You are 18 years of age or older

I agree

Appendix F

Vignette

Part 2 Case Summary (seen by all participants)

Scott is a 28 year-old Aboriginal/white* male being charged with common assault.

[either the terms 'Aboriginal' or 'white' will be included to manipulate ethnicity]*

In the evening, on November 18th, 2017, Scott and his football teammates decided to go to the local pub, after loosing their football game to their archrivals. As the night progressed, Scott and his mates were socialising with other football supporters in their local pub, which soon became crowded. It started to get late, so the boys decided to call it a night and head home. As they were exiting the pub, their archrivals arrived, celebrating their win. This made Scott instantly angry, so he decided to approach the team's captain, Mark. Scott began arguing with Mark, and verbally abusing him. Mark tried to ignore Scott and walk past him into the pub, but Scott grabbed him by his Guernsey, and punched him across the face. Mark fell back, and hit his head on the concrete. Scott broke Mark's jaw, and knocked him unconscious. Mark was in hospital for a month, and may have permanent brain damage.

[The following content will be added to the above for a given condition]

Vignette 1: Aboriginal Control Condition
At his trial, Scott's lawyer argues that Scott didn't intend to attack the stranger and only acted impulsively.

Vignette 2: White Control Condition
At his trial, Scott's lawyer argues that Scott didn't intend to attack the stranger and only acted impulsively.

Vignette 3: Aboriginal Environmental Trauma Condition

Scott's lawyer introduces evidence that Scott was subject to repeated physical abuse by his father when he was a young boy. His father used to hit him, sometimes using his belt or an electrical cord, from a very early age and all the way through to adolescence and early adulthood. Scott's mother neglected him as a child, and did not help to stop his father's abuse. Scott was often exposed to loud arguments by his parents, and often witnessed his mother being physically abused by his father.

An expert witness for the defence testified that when children suffer from physical mistreatment, this predisposes them to have a much higher risk of antisocial behavioural problems when they are adults. In this specific case, Scott reacted in a 'violent' manner, as violence is what he has repeatedly been exposed to throughout his life. The lawyer argues

that abuse victims struggle to control their behavioural impulses or understand what reactions are socially acceptable.

Vignette 4: White Environmental Trauma Condition

Scott's lawyer introduces evidence that Scott was subject to repeated physical abuse by his father when he was a young boy. His father used to hit him, sometimes using his belt or an electrical cord, from a very early age and all the way through to adolescence and early adulthood. Scott's mother neglected him as a child, and did not help to stop his father's abuse. Scott was often exposed to loud arguments by his parents, and often witnessed his mother being physically abused by his father.

An expert witness for the defence testified that when children suffer from physical mistreatment, this predisposes them to have a much higher risk of antisocial behavioural problems when they are adults. In this specific case, Scott reacted in a 'violent' manner, as violence is what he has repeatedly been exposed to throughout his life. The lawyer argues that abuse victims struggle to control their behavioural impulses or understand what reactions are socially acceptable.

Vignette 5: Aboriginal Genetic Condition

The lawyer introduces evidence about a gene associated in some circumstances with increased violence and impulsivity – the MAOA gene. There are two forms of the MAOA gene: a 'high' variant and a 'low' variant. Possession of the low variant of the MAOA gene is associated with poor impulse control, and vulnerability towards violent and antisocial behaviour, if the person has also been exposed to childhood trauma.

The lawyer introduces a genetic test that Scott is in possession of the low Monoamine Oxidase A (MAOA) gene. An expert witness for the defence testifies that people who have this form of the MAOA gene have a much higher risk of impulsive behaviour, including violence, when childhood trauma has also occurred. Consequently, this increases the likelihood for that individual in possession of the low MAOA gene to be susceptible to aggressive outburst, reactive violence and antisocial criminal acts. Consequently, the lawyer argues that because Scott possesses the low MAOA gene, it is difficult for him to make appropriate decisions, or to regulate his own behaviour.

Vignette 6: White Genetic Condition

The lawyer introduces evidence about a gene associated in some circumstances with increased violence and impulsivity – the MAOA gene. There are two forms of the MAOA gene: a 'high' variant and a 'low' variant. Possession of the low variant of the MAOA gene is associated with poor impulse control, and vulnerability towards violent and antisocial behaviour, if the person has also been exposed to childhood trauma.

The lawyer introduces a genetic test that Scott is in possession of the low Monoamine Oxidase A (MAOA) gene. An expert witness for the defence testifies that people who have

this form of the MAOA gene have a much higher risk of impulsive behaviour, including violence, when childhood trauma has also occurred. Consequently, this increases the likelihood for that individual in possession of the low MAOA gene to be susceptible to aggressive outburst, reactive violence and antisocial criminal acts. Consequently, the lawyer argues that because Scott possesses the low MAOA gene, it is difficult for him to make appropriate decisions, or to regulate his own behaviour.

Vignette 7: Aboriginal, Genetic, and Environmental Trauma Condition

The lawyer introduces evidence about a gene associated in some circumstances with increased violence and impulsivity – the MAOA gene. There are two forms of the MAOA gene: a 'high' variant and a 'low' variant. Possession of the low variant of the MAOA gene is associated with poor impulse control, and vulnerability towards violent and antisocial behaviour, if the person has also been exposed to childhood trauma.

The lawyer introduces a genetic test that Scott is in possession of the low variant of the Monoamine Oxidase A (MAOA) gene. The lawyer also provides evidence that Scott was subject to repeated physical abuse by his father when he was a young boy. His father used to hit him, sometimes using his belt or an electrical cord, from a very early age and all the way through to adolescence and early adulthood. Scott's mother neglected him as a child, and did not help to stop his father's abuse. Scott was often exposed to loud arguments by his parents, and often witnessed his mother being physically abused by his father.

An expert witness for the defence testifies that children who were physically mistreated and have this form of the gene have a much higher risk of impulsive behavior as adults, including violence.

Vignette 8: White, Genetic and Environmental Trauma Condition

The lawyer introduces evidence about a gene associated in some circumstances with increased violence and impulsivity – the MAOA gene. There are two forms of the MAOA gene: a 'high' variant and a 'low' variant. Possession of the low variant of the MAOA gene is associated with poor impulse control, and vulnerability towards violent and antisocial behaviour, if the person has also been exposed to childhood trauma.

The lawyer introduces a genetic test that Scott is in possession of the low variant of the Monoamine Oxidase A (MAOA) gene. The lawyer also provides evidence that Scott was subject to repeated physical abuse by his father when he was a young boy. His father used to hit him, sometimes using his belt or an electrical cord, from a very early age and all the way through to adolescence and early adulthood. Scott's mother neglected him as a child, and did not help to stop his father's abuse. Scott was often exposed to loud arguments by his parents, and often witnessed his mother being physically abused by his father.

An expert witness for the defence testifies that children who were physically mistreated and have this form of the gene have a much higher risk of impulsive behavior as adults, including violence.

Appendix G

Demographics

Q1: Age?

_____

Q2: Gender?

- Male
- Female
- Other
- Prefer not to say

Q3: What is your ethnicity?

- Caucasian/white
- Aboriginal/Torres Strait Islander
- Asian
- Other (Please Specify)

Q4: Are you, or have you previously, been enrolled in any of the below:

KHA106 – Brain, Mind and Emotion

Any University level law units

Any University level neuroscience units

Appendix H

Public Understanding and Attitudes towards Genetics and Genomics Scale (PUGGS)

(Sections 2 and 3)

Section 2: Belief in Genetic determinism

People vary in traits (physical features, behaviours, diseases and disorders), such as those shown in the table below. Genetic differences and environmental differences contribute to this variation. Environmental differences can for example be differences in culture, upbringing, lifestyle, eating habits, or exposure to pollution. In the table below please indicate to what extent you think genetic and environmental differences contribute to these traits.

For each of the traits below, please choose one of the options:

1= Only environmental differences contribute to the trait

2= Mainly environmental differences contribute to the trait

3= Both genetic and environmental differences contribute to the same extent to the trait

4= Mainly genetic differences contribute to the trait

5= Only genetic differences contribute to the trait

- Example: Eye colour
- Height
- Bipolar disorder
- Diabetes
- Colour blindness
- Schizophrenia
- Breast cancer
- Interest in fashion
- Addiction to gambling
- Political beliefs
- Intelligence in adults
- Severe depression
- Attention Deficit Hyperactivity Disorder (ADHD)
- Asthma
- Violent behaviour
- Religious beliefs
- Blood group (ABO)

Section 3: Knowledge about gene-environment interaction

Please read each statement below and choose one of the options (True, False or Don´t know). Please only choose "don't know" if you do not understand the statement.

1. A gene codes directly for a trait or disease.
2. Most human traits and diseases are caused by a single gene.
3. A single gene can influence several different traits or diseases.
4. A person´s height is influenced by one gene only.
5. Most traits and diseases are influenced by many different genes.
6. Most traits and diseases are caused by environmental factors only (such as diet and lifestyle).
7. A gene can only influence a single trait or disease.
8. Most traits and diseases are caused by both genes and environmental factors.
9. A person´s height is influenced by many different genes.

Thank you for completing our survey. If you wish to be placed in the draw for a $50.00 gift voucher from Myer/Coles, please click on the link below.

https://www.surveymonkey.com/r/996QNXC

Appendix I
SPSS Output

Appendix I- Please refer to the data file for additional output.